

## BELLCOMM, INC.

955 L'ENFANT PLAZA NORTH, S.W.

WASHINGTON, D. C. 20024

SUBJECT: Trip Report: Twelfth Meeting of the  
AAP Mission Requirements Panel -  
Case 610

DATE: December 4, 1968

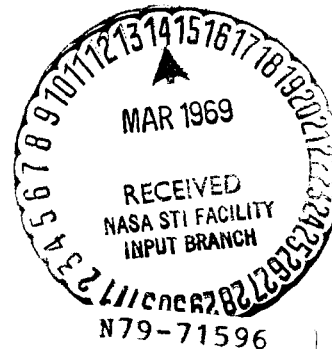
FROM: K. E. Martersteck

ABSTRACT

The principal item of discussion at the twelfth AAP Mission Requirements Panel Meeting, held at MSC on November 22, 1968, was a review of the requirement for a decoupled ATM backup mission. The panel concluded that, based on the probability of needing such a mission, the relatively little cost impact and the desire to avoid a large gap between flights in the program, there is a requirement for the decoupled mission.

Other topics discussed included the feasibility of controlled reentry of the AAP-4 S-IVB and the Cluster, the impact of using MDA port 4 as an alternate docking port, the flexible scientific airlock, attitude control using magnetic torquers and the impact of PVT gaging on SPS propellant requirements.

(NASA-CR-100225) TRIP REPORT - TWELFTH  
MEETING OF THE AAP MISSION REQUIREMENTS  
PANEL (Bellcomm, Inc.) 5 P



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MEMORANDUM FOR FILE

The twelfth meeting of the AAP Mission Requirements Panel was held at MSC on November 22, 1968. Items in the agenda (which is attached) of interest are noted below.

12.1 Review of Outstanding Action Items

12.1.1 and 12.1.2 - The target date for publication of the Mission Requirements Documents and the Baseline Reference Mission Document for the AAP missions is still December 15. The BRMD may make that date but the MRD's will probably slip, although draft versions of the three requirements documents currently are in various stages of review.

12.1.6 - Mr. H. Jeffries, MSFC/R-AERO, presented follow-up material to the report made at the last MRP meeting on this action item. Study results indicate that disposal by retro burn is feasible for the AAP-4 S-IVB stage. To hit a footprint 3000-4000 kilometers long (about an ocean width) within the IU lifetime, a system of solid-propellant rockets weighing an estimated 1675 lbs would be required.

Two methods of cluster disposal were discussed. The first method waits until the last moments of a normal orbit decay and depends on the drag difference between tumbling and controlled attitude. The attitude is held end on until the propitious moment, then sent tumbling. Such a scheme requires an attitude control system to be available up to 600 days from launch if a  $-2\sigma$  atmospheric density is encountered. Furthermore, the sensitivity to orbit determination is extreme; an error of only 1 meter/second causes a change in impact of 1-2 hours, rendering the scheme all but useless.

In the second method a retro system for Cluster disposal was considered. It was estimated that a 750 lb retro system could return the cluster within a footprint of about 4500 kilometers. Again an active attitude control system would be required up to 600 days after launch.

12.1.7 - As at the previous meeting, this action item was the focal point of considerable discussion. Presentations were made reviewing the requirements for a backup decoupled mission in the program. The principal criteria considered were probability

of the need for a decoupled mission, cost penalty and the avoidance of a major gap in AAP flights. There was a question raised concerning the medical prerequisites for the decoupled mission. As a result, MSC accepted an action item to reach a center position on the circumstances under which they will accept a decoupled mission, considering both medical and operations criteria.

The ad hoc committee working on this action made the following recommendations which were accepted by the Panel:

- (1) Retain the capability to fly a backup decoupled mission.
- (2) The backup decoupled mission should be flown at an altitude and inclination similar to the primary mission to minimize the mission planning and analysis impact.
- (3) If the Orbital Workshop fails prior to satisfactory completion of program objectives of the AAP-3A mission and the launch of a backup Workshop is delayed extensively, a fifth CM/SM should be considered to complete the objective of using the Workshop in support of solar astronomy.
- (4) No design effort should be expended to assure that an alternate decoupled mission can be flown beyond that required for the primary mission and backup decoupled mission.
- (5) Flight planning and crew training for an alternate decoupled mission (one which becomes necessary after the LM/ATM has reached station keeping) should be planned.
- (6) No special effort should be expended to assure that the Cluster has a revisit capability after the AAP-3/AAP-4 mission. However, such capability should not be specifically designed out.

As a result of discussion on the last recommendation, the Panel took an action item to identify all items in the current design which preclude Cluster revisit after the AAP-3/AAP-4 mission. Also K. L. Turner, Headquarters/MLA, accepted Headquarters' actions to clarify the statement in Program Directive 5A concerning this issue and further, to determine whether there is a Headquarters' requirement for data from the Cluster after the return of the AAP-3 CM/SM to earth.

12.1.8 - A long list of areas which must be studied to ascertain the impact of docking a CM/SM to MDA port 4 was presented by MSFC. The Centers do not plan to initiate these studies unless they are specifically directed to do so and resources are provided. Headquarters was requested to clarify the intent of retaining MDA port 4.

12.1.10 - H. E. Whitacre, MSC/KM, reported that the Martin Company is comparing the merits and problems of three approaches to experiment pointing: moving the vehicle, a mirror system or a flexible airlock mount. The Martin study will be completed by December 31.

#### 12.4 Discussions of Magnetic Torquing for Attitude Control

O. K. Garriott, MSC/CB, gave a tutorial lecture on the merits of magnetic torquers for attitude control. He recommended emphasis on analysis of the ability of magnetic torquers to maintain the X-POP attitude. H. E. Worley, MSFC/R-AERO, presented arguments against replacing the WACS with magnetic torquers.

#### 12.5 Discussion of SPS Propellant Requirements for PVT Gaging

H. E. Whitacre, MSC/KM, reviewed the inability to accurately determine the SPS propellant quantity in zero-g or low-thrust conditions. This could render it impossible to predict satisfactory completion of the planned SPS deorbit burn and result in hazardous reentry and/or landing conditions. As a work-around, MSC is planning for a two-step deorbit. The first burn of eight-seconds duration would provide sufficient SPS propellant settling for an accurate quantity determination without committing to a reentry. The second burn would then complete the deorbit using the SPS or, if necessary, the RCS. It was proposed that 400 lbs of SPS propellant be added to ensure that the eight-second first burn could be completed in order to accurately determine the remaining SPS propellant quantity. The author suggested that if the propellant supply were so low that the first burn could not be completed, accurate measurement would be only of academic interest. Therefore, the utility of carrying the additional propellant was questionable. The matter will be reevaluated by MSC.



K. E. Martersteck

1025-KEM-dcs

Attachment

## AGENDA

### TWELFTH MEETING OF THE MISSION REQUIREMENTS PANEL

MSC

BUILDING 2, ROOM 517

NOVEMBER 22, 1968, 8:30 A.M.

#### 12.1 Review of outstanding action items.

- 12.1.1 Publish the Mission Requirements Document for AAP-1/AAP-2, AAP-3A, and AAP-3/AAP-4, MRP AI 6.2.
- 12.1.2 Publish the Baseline Reference Mission Document for AAP-1/AAP-2, AAP-3A, and AAP-3/AAP-4, MRP AI 6.3.
- 12.1.3 Define the Mission Requirements Panel Documentation Plan, MRP AI 8.1.
- 12.1.4 Establish the experiments compatability for the AAP-1/AAP-2 Mission, MRP AI 8.4.
- 12.1.5 Prepare Experiments Operations Requirements Section of MRP for AAP-3A and AAP-3/AAP-4, Experiment Sub-Panel AI 2.3.
- 12.1.6 Establish the feasibility of controlled reentry of the spent S-IVB stage and the MDA/AM/OWS, MRP AI 10.2.
- 12.1.7 Formulate back-up program plans for utilization of Back-up MDA/AM/OWS and LM/ATM hardware, MRP AI 10.3.
- 12.1.8 Determine the impact of using Port 4 as an alternate docking Port, MRP AI 11.1.
- 12.1.9 Resolve RID's assigned to the MRP by the ATM PDR Board, MRP AI 11.2.
- 12.1.10 Determine if flexible scientific airlock is required for experiment pointing, MRP AI 11.3.

#### 12.2 Performance and Weight Status Report.

#### 12.3 Report from WACS PRR Working Groups.

#### 12.4 Discussions of magnetic torquing for attitude control.

#### 12.5 Discussion of SPS Propellant Requirements for PVT Gaging.

#### 12.6 Sub-Panel Reports.

#### 12.7 New Items.